

time the stigmas are well developed, but not sufficiently glutinous to hold pollen. The anthers are exceedingly small, and show no signs of dehiscence until about two weeks after the stigmas are dry, at which time the pollen is shrunken, and apparently lifeless. If the grains examined contained fluid, it escaped detection. Frequent observations of the plant in its habitat were made, as well as a close study of its essential parts under the microscope.

The foregoing facts seem to lead to but one conclusion, namely, that the plant is a hybrid.—E. C. HOWE, *Yonkers, N. Y.*

CARNIVOROUS PLANTS. III.—EXPERIMENT NO. 6.—Placed upon a leaf, which had had the sunlight during the morning, a larva (same as in No. 5), at 2 P. M., June 6, '79.

- 20 min. the submarginal t. nearest the specimen had approached and touched it; the marginal t. on one side had moved through an angle of 45° .
- 80 “ continued movement of those t. nearest the larva, many being closed upon it; no further change was perceptible in the marginal t.
- 112 “ the submarginal t. opposite those mentioned before, have moved considerably; movement among the disk t. perceptible.
- 3 hrs. no change from the last.
- 20 “ considerable movement among all the t.; the submarginal mostly closed upon the specimen; all but about 6 or 8 of the marginal bent over toward the object.
- 22 “ about the same as the last.
- 29 “ all the submarginal, the edge of the leaf nearest the specimen, and some of the marginal t. much inflected.
- 67 “ no change.
- 73 “ a slight reflex action is noticeable.
- 94 “ the marginal and submarginal t. were wholly reflexed; disk t. partly so.
- 109 “ completely reflexed.
- 126 “ leaf with secretion on the t.; perfectly natural.

EXPERIMENT NO. 7.—Placed upon a leaf, which had had sunlight during the forenoon, a minute piece of wood at 2 P. M., June 6, '80.

- 20 min. 10 or 12 of the submarginal t. were inflected, and three or 4 of these touched the specimen.
- 80 “ some further movement of the submarginal t. on one side; elsewhere no perceptible change; a few t. situated on the petiole had moved somewhat.
- 112 “ the submarginal and disk t. had moved but little from the last.
- 3 hrs. no change from the last.
- 20 “ no perceptible change.
- 29 “ an apparent reflex action, although slight.
- 69 “ all the t. were reflexed.
- 84 “ leaf with secretion on the t.; perfectly natural.

EXPERIMENT NO. 8. — Placed a cube (edge 1.16 inch) of hardened egg albumen upon the disk of a leaf, at 2.45 P. M., June 10, 1879.

- 30 min. perhaps there had been a slight movement of the disk tentacles, but none of the others showed any change.
 2 hrs. evident movement of the disk tentacles.
 17 " the edge of the leaf and all of the disk, submarginal and marginal tentacles were inflected and touched the specimen, except the tentacles and edge of the leaf on one side for about one fourth of the circumference.
 24 " all the tentacles except five or six of the marginal, and the entire edge of the blade, were inflected*; egg all softened, opaque but not viscid.
 41 " entirely closed except two of the marginal tentacles.
 47 hrs. several of the marginal tentacles were reflexed; a soft and viscid semi-fluid substance is all that remains of the egg.
 67 hrs. the marginal tentacles, with the exception of two or three, were standing at an angle of 90° with the blade, the sub-

*The margin of the blade of the leaf is often more or less incurved, according to the substance undergoing absorption; apparently if the matter is easily absorbed the whole leaf seems to be excited and all parts are brought into action. In this case, however, the method of incurving was somewhat peculiar, and I am not aware that it has ever been recorded. When fully inflected the blade was pentagonal in outline. (Fig. 1.)

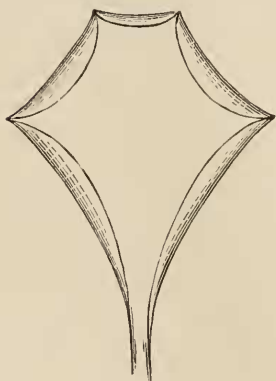


FIG. 1. (3X)

To the intense exertion on the part of the leaf to assimilate all the absorbable matter contained in the substance placed upon the disk; to the undue excitement caused by an over-dose of an easily absorbed food, I am led to ascribe, as the direct cause, the death of the leaf, noted at the end of the experiment.

Three other forms of marginal incurvation are mentioned by Darwin. [*Insectivorous Plants*, p. 12.]

"For instance, I placed bits of hard-boiled egg on three leaves; one had the apex bent towards the base; the second had both distal margins much incurved, so that it became almost triangular in outline, and this perhaps is the commonest case; while the third blade was not at all affected, though the tentacles

were as closely inflected as in the two previous cases. The whole blade also generally rises or bends upwards, and thus forms a smaller angle with the foot-stalk than it did before. This appears at first sight a distinct kind of movement, but it results from the incurvation of that part of the margin which is attached to the foot-stalk, causing the blade, as a whole, to curve or move upwards."

stance remaining of the egg adhering to them as a white opaque mass.

- 74 hrs. the same as the last except the substance on the tentacles has turned brown.
- 91 " the marginal tentacles were all reflexed except those on one side where they were held by the viscid substance mentioned above.
- 98 hrs. all the submarginal tentacles, for at least one half the circumference, standing at an angle of 90° with the blade.
- 137 hrs. the tentacles were nearly all reflexed, and those that were not were simply held back by the remaining substance of the egg.
- 148 hrs. the leaf was expanded but somewhat stuck together in parts by remains of egg; the leaf seemed almost lifeless; the tentacles were shrunken and with no secretion; however, *the remainder of the plant seemed to be in a more thriving condition than at the opening of the experiment.*
- 186 hrs. the substance on the leaf had become fibrous; leaf fully expanded; no secretion.
- 195 hrs. the leaf on one side was so covered with the fibrous substance, mentioned in the last note, as to appear quite dead.
- 220 hrs. the leaf was apparently, rapidly dying.
- 316 " the leaf was completely dead and covered with a mold.*

AN EASILY MADE OBSERVATION.—Several years since I constructed a couple of simple machines for measuring the longitudinal growth of plants which were so effective for work and so easily made withal that it may be well to describe them for the benefit of pupils who may wish to make some experiments. They were essentially the same as the arc indicator described by Sachs in his Text Book. My arc indicators consisted of square pieces of manilla paper tacked to suitable frames; upon these arcs were described and divided into spaces of 5° each. At the centers small pulleys made of perfectly round sections of corks were placed and so arranged as to revolve with the utmost ease. By properly fastening a strip of manilla paper to the large square piece, the cork pulley was easily held in place by a pin passing through the strip and exactly through the center of the cork and the center of the arc, the pin turning in the paper supports, but being fixed in the cork. To the cork a delicate finger made from a straight "splint" of a common corn broom, was attached to serve as an index. A silk thread to be attached to the plant whose growth was to be observed was wound once around the pulley, and to the free end a weight heavy enough to little more than counter-balance the index, was attached.

It took but little longer to make these two instruments than it has taken me to describe them. I immediately put them in place twelve inches or so above a couple of young bean seedlings (*Phaseolus* sp.)

*The same as the mold spoken of in a previous foot-note.